Claims

1.   A device for carrying out a tidal peritoneal dialysis treatment of a patient in a plurality of cycles, each cycle
5   including a fill period (F), a dwell period (Dw) and drain period (Dr), the device including:
        a processor (31);
        a cycler (1) connected to the processor and adapted to fill the abdominal cavity of the patient with dialysis
10   fluid, and to drain the abdominal cavity; and
        a sensor (37) connected to the processor and adapted to sense during the draining a variable related to the draining of the dialysis fluid from the abdominal cavity;
wherein the processor (31) is adapted to initiate
15   interruption of the draining, at least for most of the cycles of the treatment, when the variable reaches a breakpoint at which the variable is radically changed, thereby leaving a residual volume of dialysis fluid in the abdominal cavity.
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2.   A device according to claim 1, including means (31,32,35,36) for determining a first parameter concerning a desired target volume of the dialysis fluid to be contained in an abdominal cavity of the patient after each fill period
25   of the treatment.

3.   A device according to any one of claims 1 and 2, including means (31,32,35,36) for determining a second parameter concerning a total volume of a dialysis fluid to
30   be used during the remaining part of the treatment.

4.   A device according to any one of the preceding claims, including means (31,32,35,36) for determining a third parameter concerning a total length of time of the remaining
35   part of the treatment.

5.   A device according to any one of the preceding claims, including means (31,32,35,36) for determining a fourth parameter concerning a residual volume of dialysis fluid in the abdominal cavity after the drain period.

6.   A device according to claims 2 - 5, wherein the processor (31) is adapted to calculate for the next one of said cycles by means of the parameters a fill volume (VF) of the dialysis fluid and a fill/dwell time including the time of the fill period and the dwell period.

7.   A device according to claim 6, wherein the cycler (1) is adapted to fill the abdominal cavity of the patient with the calculated fill volume of the dialysis fluid until the target volume is reached, and to drain the abdominal cavity after the calculated fill/dwell time.

8.   A device according to any one of claims 6 and 7, wherein the processor is adapted to set the dwell period to a constant time value for substantially all cycles of the treatment at least for certain patients to be treated.

9.   A device according to any one of claims 5 - 8, including means (31,32,35,36) for determining an initial, fifth parameter concerning an expected ultrafiltration volume, wherein the processor (31) is adapted to considered the fifth parameter in the calculation of the fill volume (VF) of the dialysis fluid.

10.   A device according to any one of claims 6 to 9, wherein the processor (31) is adapted to calculate also a number of said cycles to be performed during the remaining part of the treatment.

11.   A device according to any one of claims 6 to 10, wherein processor (31) is adapted to make a relatively small

adjustment of the target volume determined by the first means for the cycles following after the first cycle.

12. A device according to any one of the preceding claims, wherein said variable includes the flow rate of the dialysis fluid during the drain period.

13. A device according to any one of the preceding claims, wherein said variable includes a pressure in the abdominal cavity of the patient during the drain period.

14. A device according to at least claim 9, wherein the sensor (37) is adapted to sense a drain volume of the drained dialysis fluid after the drain period and wherein the processor (31) is adapted to calculate the residual volume by means of the drain volume, the expected ultrafiltration volume and the fill volume, and to determine a trend of the residual volume after at least two cycles.

15. A device according to claim 14, wherein the processor (31) is adapted to adjust the expected ultrafiltration volume if the trend exhibits an increasing or decreasing value of the residual volume and if said value exceeds a predetermined first limit value.

16. A device according to any one of claims 14 and 15, wherein the cycler (1) is adapted to drain, during a following cycle, the abdominal cavity completely so that the residual volume is substantially zero if the trend exhibits an increasing or decreasing value of the residual volume and if said value exceeds a predetermined second limit value, and wherein the processor (31) is adapted to calculate a new expected ultrafiltration volume based on the drain volume after the complete draining.

17. A device according to any one of the preceding claims, wherein the sensor (37) is adapted to detect an initial value of said variable at the beginning of the drain period and a critical value of said variable, wherein the

5   breakpoint is reached when the variable reaches the critical value.

18. A device for carrying out a tidal peritoneal dialysis treatment of a patient in a plurality of cycles, each cycle

10 including a fill period (F), a dwell period (Dw) and drain period (Dr), the device including:

  means (31,32,35,36) for determining a first parameter concerning a desired target volume of the dialysis fluid to be contained in an abdominal cavity of the patient after

15 each fill period of the treatment;

  means (31,32,35,36) for determining a second parameter concerning a total volume of a dialysis fluid to be used during the remaining part of the treatment;

  means (31,32,35,36) for determining a third parameter

20 concerning a total length of time of the remaining part of the treatment;

  means (31,32,35,36) for determining a fourth parameter concerning a residual volume of dialysis fluid in the abdominal cavity after the drain period;

25   a processor (31) adapted to calculate for the next one of said cycles by means of the parameters a fill volume (VF) of the dialysis fluid and a fill/dwell time including the time of the fill period and the dwell period;

  a cycler (1) connected to the processor and adapted to

30 fill the abdominal cavity of the patient with the calculated fill volume of the dialysis fluid until the target volume is reached, and to drain the abdominal cavity after the calculated fill/dwell time; and

  a sensor (37) connected to the processor and adapted to

35 sense during the draining a variable related to the draining of the dialysis fluid from the abdominal cavity;

wherein the processor (31) is adapted to initiate interruption of the draining when the variable reaches a breakpoint at which the variable is radically changed, thereby leaving a residual volume of dialysis fluid in the abdominal cavity.

19. A method for carrying out a tidal peritoneal dialysis treatment of a patient in a plurality of cycles, each cycle including a fill period, a dwell period and drain period, the method including, for substantially all cycles, the steps of:

filling the abdominal cavity of the patient with a fill volume of dialysis fluid;

draining the abdominal cavity;

sensing during the draining a variable related to the draining of the dialysis fluid leaving the abdominal cavity;

interrupting the draining when, at least for most of the cycles of the treatment, the variable reaches a breakpoint at which the variable is radically changed; and

leaving a residual volume of dialysis fluid in the abdominal cavity.

20. A method according to claim 19, including the further step of:

determining a first parameter concerning a desired target volume of the dialysis fluid to be contained in an abdominal cavity of the patient after each fill period of the treatment.

21. A method according to any one of claims 19 and 20, including the further step of:

determining a second parameter concerning a total volume of a dialysis fluid to be used during a remaining part of the treatment.

22. A method according to any one of claims 19 to 21, including the further step of:

determining a third parameter concerning a total length of time of the remaining part of the treatment.

23. A method according to any one of claims 19 to 22, including the further step of:

determining a fourth parameter concerning a residual volume of dialysis fluid in the abdominal cavity after the drain period.

24. A method according to claims 19 to 23, including the further step of:

calculating for the next one of said cycles by means of the parameters a fill volume of the dialysis fluid and a fill/dwell time including the time of the fill period and the dwell period.

25. A method according to claim 24, wherein the filling step includes filling the abdominal cavity of the patient with the calculated fill volume of the dialysis fluid until the target volume is reached, and wherein the draining step includes draining the abdominal cavity after the calculated fill/dwell time.

26. A method according to any one of claims 24 and 25, wherein the calculating step permits the dwell period to be set to a constant time value for substantially all cycles of the treatment at least for certain patients to be treated.

27. A method according to any one of claims 24 to 26, including the further step of:
determining as an initial measure a fifth parameter concerning an expected ultrafiltration volume, wherein the fifth parameter is also considered in the step of calculating the fill volume of the dialysis fluid.

28. A method according to any one of claims 24 to 27, wherein the calculating step also includes calculating of a number of said cycles to be performed during the remaining part of the treatment.

29. A method according to any one of claims 24 to 28, wherein the step of determining the first parameter includes a relatively small adjustment of the target volume for the cycles following after the first cycle.

30. A method according to any one of claims 19 to 29, wherein said variable includes the flow rate of the dialysis fluid during the drain period.

31. A method according to any one of claims 19 to 30, wherein said variable includes a pressure in the abdominal cavity of the patient during the drain period.

32. A method according to claim 27 and possibly any one of claims 28 to 31, including the further steps of:
sensing in a drain volume of the drained dialysis fluid after the drain period;
calculating the residual volume by means of the drain volume, the expected ultrafiltration volume and the fill volume; and
determining a trend of the residual volume after at least two cycles.

33. A method according to claim 32, including the further step of:
adjusting the expected ultrafiltration volume if the trend exhibits an increasing or decreasing value of the residual volume and if said value exceeds a predetermined first limit value.

34. A method according to any one of claims 32 and 33, including the further step of:

draining, during a following cycle, the abdominal cavity completely so that the residual volume is substantially zero
5   if the trend exhibits an increasing or decreasing value of the residual volume and if said value exceeds a predetermined second limit value, and

calculating a new expected ultrafiltration volume based on the drain volume after the complete draining.
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35. A method according to any one of claims 19 to 34, wherein the sensing step includes detecting an initial value of said variable at the beginning of the draining step and a critical value of said variable, wherein the breakpoint is
15   reached when the variable reaches the critical value.

36. A method according to any one of claims 19 to 35, wherein the residual volume is substantially zero before the first cycle of the treatment.
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37. A method according to any one of claims 19 to 36, wherein the residual volume is substantially zero after the last cycle of the treatment.

25   38. A method for carrying out a tidal peritoneal dialysis treatment of a patient in a plurality of cycles, each cycle including a fill period, a dwell period and drain period, the method including for substantially all cycles steps of:

a) determining a first parameter concerning a desired
30   target volume of the dialysis fluid to be contained in an abdominal cavity of the patient after each fill period of the treatment;

b) determining a second parameter concerning a total volume of a dialysis fluid to be used during a remaining
35   part of the treatment;

c)   determining a third parameter concerning a total length of time of the remaining part of the treatment;

d)   determining a fourth parameter concerning a residual volume of dialysis fluid in the abdominal cavity after the drain period;

e)   calculating for the next one of said cycles by means of the parameters a fill volume of the dialysis fluid and a fill/dwell time including the time of the fill period and the dwell period;

f)   filling the abdominal cavity of the patient with the calculated fill volume of the dialysis fluid until the target volume is reached;

g)   draining the abdominal cavity after the calculated fill/dwell time;

h)   sensing during the draining a variable related to the draining of the dialysis fluid leaving the abdominal cavity;

i)   interrupting the draining when the variable reaches a breakpoint at which the variable is radically changed; and

j)   leaving a residual volume of dialysis fluid in the abdominal cavity.